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OZONE; ITS RELATIONS TO HEALTH AND DISEASE.

BY E. S. GAILLARD, M.D., OF BALTIMORE, MD.—AN ESSAY WHICH RECEIVED THE
FISKE FUND PREMIUM.

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THIS body, once unknown and long neglected, but now commanding the enthusiasm of all engaged in the investigation of its properties, is yet to form a most important chapter in every volume of medical literature. Emerging from the shades of an enshrouding obscurity, and rapidly becoming universally known, "*clarior e tenebris*" might not inaptly be cited as the brief but terse description of its previous history. When more patient and protracted analysis shall bring the sure reward of a still better comprehension, it will be prized as "the pillar of fire to give light" through the tedious wilderness of obscure and discouraging theory. But the nature of such a paper as the present forbids the indulgence of prediction, when the future alone can verify convictions which would induce the spirit of prophecy. With brevity and conciseness, therefore, we will, without preface, consider the subject contemplated.

It is now generally conceded that Van Marum was the first to call the attention of scientific men to the existence of some anomalous body, which farther investigations proved to be that of which we now write. This philosopher made his first experiments in 1785, but the results were too unsatisfactory to secure general attention. He had charge of the large electrical machine in Taylor's Museum, and with this he excited sparks in a tube filled with oxygen; after the disengagement of 5,000 sparks, the gas had acquired a very strong and characteristic odor. M. Schönbein, of Bâle, became interested in these experiments, and determined to fully investigate the subject. His researches were actively made and promptly given to the public. From this period the true history of the subject begins—that is, from 1842, two years after Schönbein's discovery.

To M. Schönbein really belongs the credit of having introduced
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this subject to the attention of the scientific in and out of the medical profession. A general interest was at once awakened, and we find monographs almost simultaneously published in different parts of Europe. Its composition, nature and properties formed subjects for excited controversies, and we find such distinguished men as Marignac, De la Rive, Arago, Becquerel, Liebig, Bergmann, Berzelius, Osann and others striving for the position of teachers and expounders of this novel agent. On account of its peculiar and strong odor it received from M. Schönbein the appropriate name it now bears, ozone, from the Greek verb, *οζωω*, to yield an odor. Although this name reveals nothing of the composition of this body, and most investigators have attempted to make a more suggestive substitute, yet it has been retained, both for its appropriateness and as a merited tribute to him who gave it. Ozone was for a long time claimed as a binoxide, or peroxide of hydrogen; it was written in chemical abbreviation HO^2 , thus indicating the condition of the binoxide to be the most invariable. Schönbein regarded it as a regular constituent of the atmosphere, and the condition of the binoxide as that most uniformly manifested; this view was for a time doubted, but is now regarded as most generally correct. According to M. Schnepf, this fact was first promulgated in 1849, about seventeen years after its properties were generally investigated. After so many years of patient examination, it is at least most probable that this view is scientifically correct. Schönbein states that there is formed, from the same influences, a small proportion of nitric acid. The formation of nitric acid, as thus stated, was advanced by Cavendish as early as 1784, and fully proved after that time by Bergmann and others. Liebig investigated this fact in 1826, M. Boussingault in 1839, and M. Barral in 1852. Heller has attempted to prove the constant existence of nitric acid in the atmosphere, and, for this purpose, presented a memoir to the Academy of Sciences at Vienna. The report of the Academy was not entirely favorable, but he is sustained by many and prominent authorities, who not only differ with the Vienna Academy, but unanimously certify, in addition to this, that there is formed, at the same time, ozone and ammonia, &c., as claimed by M. Schönbein:—"Malgré l'autorité de cette société savante, il reste néanmoins acquis à la science, par suite des travaux de Cavendish, de Bergmann, de M. Liebig, de MM. Heller, Boussingault et Barral, que l'électricité contenue dans l'air atmosphérique, agit sur les deux éléments fondamentaux de ce fluide, pour donner naissance à l'ozone, et sans doute en même temps aussi, à une proportion très-faible d'acide nitrique et d'ammoniaque," &c. This claim, then, of Schönbein is fully admitted; for the testimony of the authorities quoted, whilst supporting the claim of M. Heller as to the constant existence of nitric acid in the atmosphere, fully proves that the same causes produce also ozone. The absolute and uniform composition of ozone has been, among chemists and philosophers, the subject of

repeated analysis, and, until recently, of constant controversy. Schönbein claimed it as a binoxide, or peroxide of hydrogen; Faraday denied this, and considered ozone as "oxygen in an isomeric state," or as a "simple modification of oxygen, in an allotropic condition of that body." Mr. Williamson, of the Royal Society of London, pronounced that according as ozone is produced by a galvanic battery, developed by the electric spark, or brought forth by the action of air on phosphorus, it is a hyperoxide of hydrogen and azotic acid, or a mixture of the two. Berzelius opposed this view, and contended to prove that Faraday was correct.

At this time a series of experiments were instituted, by MM. Marignac and De la Rive, two savans of Geneva, for the purpose of demonstrating the truth of what had been so frequently advanced—that ozone is only oxygen, in the peculiar state given to it by electricity. These experiments were commenced a short time after the publication, by MM. Frémy and Becquerel, of their original views, in their joint work "*Electro-chemical Researches on the Properties of Electrified Bodies.*" It is to MM. Frémy and Becquerel that the scientific world is indebted for all that is original in this view—that ozone is but oxygen in the characteristic state induced by its subjection to electricity. This view, original with them, has been brought prominently before the public by MM. Marignac and De la Rive. It was apparently demonstrated, by MM. Frémy and Becquerel, that the "ozonoscopes" (or tests for ozone) would not be affected unless the oxygen be electrified. In the presence of oxygen, or electricity singly, they remained unchanged; but as soon as the oxygen was electrified, ozone, it appeared, was clearly manifested. This fact was proved, it was thought, by a few simple and ingenious experiments. Before alluding to experiments of any kind, however, it is proper to briefly explain the nature and composition of the "ozonoscope." This description will be general, as well as brief, and all the details and important suggestions connected with them will be postponed for that portion of the essay devoted to their consideration.

An ozonoscope is a slip of paper or cloth, on which has been spread a compound of gelatinized starch and the iodide of potassium. Ozone, playing the part of an acid, unites with the potassium, and, in forming potassa, liberates a certain proportion of free iodine; the iodine, thus liberated, unites with a portion of starch, forming the characteristic blue iodide of starch. The depth of this blue demonstrates the amount of ozone present, or, in the phraseology commonly used, chromatic intensity becomes the measure of ozonic quantity. It is not necessary to enter farther into the description of the ozonoscopes to insure a full understanding of the chemical changes taking place when they are experimentally used; farther details will therefore be postponed until they form the actual subject of consideration.

MM. Frémy and E. Becquerel, in their experiments, placed one of these ozonoscopes in a glass tube which was filled with oxygen and

then hermetically sealed. By means of metallic bulbs at each end of this tube, electric sparks were made to leap (from the point of an ordinary conductor) across this volume of oxygen. The ozonoscope was immediately made blue. It was now necessary to prove that this result was not caused by the decomposition of the iodide of potassium (on the ozonoscope) by means of the electricity used. The ozonoscope, for this purpose, was then placed in a similar tube, under similar precautions, and the tube, after being filled with hydrogen gas, was hermetically sealed. The same electrical agents were then applied to it. The ozonoscope remained unchanged. To succeed in this last experiment, the authors advise that only the purest hydrogen gas should be used, and that the ozonoscope shall be freed from the atmospheric air it contains. If the hydrogen is not absolutely pure and the ozonoscope thus prepared, the experiment fails; the least trace of oxygen, in the hydrogen or in the ozonoscope, will be sufficient to produce this failure. The oxygen, if thus present in the feeblest proportions, becomes electrified, and, reacting on the ozonoscope, generates the blue color which is the unanswerable indication of failure in this hydrogen experiment. These two experiments would apparently show that the ozonoscope, in the experiment with oxygen, is only made blue by the oxygen after being electrified, and that electricity, acting upon the iodide of potassium (on the ozonoscope) is not sufficient to produce its decomposition, and thus cause any change in the ozonoscope containing it.

Frémy and Becquerel proved that the ozonoscope, in the hermetically sealed tube containing oxygen, would be made blue when electricity was made to act upon the oxygen "by influence." This was done by dispensing with the metallic bulbs and by placing the tube between the branches of a conductor whose points touched the surface of the tube. The sparks, in passing from one point to the other, would (*in transitu*) lick the surface of the tube and thus affect the oxygen it contained; this oxygen would become electrified and the test paper rendered blue. This last experiment was, to all appearances, carefully made and really intended to remove all doubt and uncertainty; for among the many causes which are constantly and even inappreciably conspiring to vitiate these experiments, it is well known that the electric spark itself is frequently accompanied by foreign matter. This matter, it was thought, might produce some obscure but material change in the ozonoscope; and it was decided to fully guard against this source of error. The experimenters anticipated the possibility of such a charge, on the part of those ever ready to cavil against the position they had assumed, and wisely made such a charge impossible.

The next position established was, that the ozonoscope would remain unchanged in a volume of oxygen gas. An ozonoscope was, for proving this, carefully suspended in a receiver filled with this gas; after remaining ten days, it was entirely unchanged. To prove

that the gas was pure, it was electrified, and the paper immediately became blue. The same experiment demonstrated the careful preparation of the ozonoscope. The gas was electrified by the introduction of platinum wires, in connection with an electrical machine.

These experiments were all made (and apparently carefully made) by MM. Frémy and Becquerel.

M. Scoutetten next furnishes additional proof that electricity alone could not produce any change in the ozonoscope. He placed one in vacuo and subjected it to intensely electrical influences. It remained unchanged, but became blue when oxygen was introduced and then electrified. It was thus *apparently* proved that oxygen alone is not sufficient to produce a chromatic change in the ozonoscope; that electricity alone is also insufficient for the production of such a change; that electrified or pure hydrogen produces no change; but that oxygen, as soon as it is electrified, produces a sensible and distinct change.

One farther step, to commend these experiments to the approval of the scientific world, was now necessary. It being proved that oxygen did not affect the ozonoscope; that electricity, hydrogen alone and electrified hydrogen produced no change, but that electrified oxygen produced a marked blue color, it was essential to prove that the iodide of potassium was, in conjunction with starch, an efficient and reliable means of investigation; that an ozonoscope, thus prepared, would always manifest the presence of electrified oxygen, or, what was *claimed* to be the same agent, ozone. The ozonoscope, chemically considered, is the iodide of potassium, for this only is affected by ozone; the starch is added, that we may perceive the degree of change which ozone produces on the iodide of potassium; but the starch in no way contributes to the production of this change. *The iodide of potassium is the agent; the starch only indicates the extent of its action.* Hence it is necessary to show that the iodide of potassium will uniformly and efficiently act; that it will always manifest the presence of ozone. If it always acts in the presence of ozone, we, by the medium of starch, recognize the *fact and the extent of its action.* Is it uniformly and proportionally affected by ozone?

To prove this fact, eudiometrical glass tubes, filled with pure oxygen, were inverted over a solution of the iodide of potassium and distilled water—oil being poured over the surface of the water, to prevent the influences of the atmosphere. By means of platinum wires, the oxygen, in the tubes, is subjected to the action of an electric current and thus gradually electrified. Becoming electrified, it acts, as electrified oxygen, on the potassium contained in the solution of the iodide of potassium and water. This portion of potassium, so acted upon, becomes potassa, by its union with a portion of oxygen. The potassium, thus uniting with a portion of oxygen, liberates a corresponding quantity of iodine; and this iodine, becoming liberated from the potassium, unites with the water, forming in part

the solution. Each volume of oxygen, thus electrified in the tube and uniting with the potassium in the solution, is replaced by a corresponding volume of the solution. As the experiment progresses, the solution becomes gradually tinged of a yellow color, from the iodine liberated, as portions of the oxygen unite with corresponding portions of the iodide of potassium. At the conclusion of the experiment, the gas has disappeared, having all united with the potassium in the solution; the solution, of a deep yellow color, fills the glasses; and the capacity of the glasses becomes the measure of depression, on the surface of the solution. The results are the same, whether the glasses are filled with ozone, or with oxygen and this oxygen then electrified. In either case, we have it demonstrated that the iodide of potassium is entirely decomposed; and by starch we are able to measure and to see the degree and the end of this decomposition. By the iodide of potassium, then, we are able to detect the existence of ozone, in consequence of its decomposition, in the presence of this agent; and by starch, we are enabled to measure the extent of this decomposition. When these are properly combined, we have a true ozonoscope.

Scoutetten has published (in 1856) quite an extensive work, taking his own experiments and those of the most distinguished observers, to prove the truth of the position first taken by MM. Frémy and E. Becquerel, and afterwards so ingeniously defended by MM. Marignac and De la Rive. Scoutetten's work is styled, "Ozone, or Researches Chemical, Meteorological, Physiological, and Medical, upon Electrified Oxygen:" so fully satisfied was he and the leading authorities of the world, that ozone was electrified oxygen. The experiments are only equalled in ingenuity, care and apparent scientific candor, by their great number; they are exceedingly interesting and plausible, and, in their results, *seem* to indicate the truth of this proposition, that ozone is electrified oxygen, and the converse of this. As the work published by Scoutetten, in 1856, attracted much attention, both in Europe and America, and as its author very deservedly was awarded much credit for his views and the ingenuity with which he sustained them, it is proper that I should give his opinion, as detailed in this work, on the composition of ozone. "I consider ozone as a body subject, like all chemical combinations, to conditions which favor its composition, or decomposition; possessing constant properties which serve to distinguish it from all other agents; a body producing varied and powerful effects, and which, from the multiplicity of the parts it performs in nature and the greatness of its results, deserves a distinct and exalted place. Although we still use the word given by M. Schönbein and now adopted, *we have no doubt of the chemical composition of ozone; it is electrified oxygen.*" This position has been fortified by hard labor and scientific research; and had to sustain it the names and deliberate testimony of the most prominent and careful authorities in Europe. One year since it was

accepted as the doctrine which all of the best investigators were ready to endorse and defend. Dr. Gregory, in his last and latest published opinions on this subject, thus writes:—"It was at one time supposed, that ozone contained hydrogen, and it has been described as an oxide of hydrogen, HO^2 . But even when formed in contact with water, there appears to be but one ozone. The recent researches of Andrews seem to establish this point beyond doubt, and it is certain, that perfectly dry oxygen gas yields ozone when electric sparks are passed through it." This is quoted from the published opinions of Dr. William Gregory, F.R.S.E., Prof. of Chemistry in the University of Edinburgh. Dr. Andrews, to whom he alludes, published similar opinions in the Philosophical Transactions for 1856; and in the Journal of the Chemical Society of London, at a later period. At the same time, Dr. Andrews declared ozone to be an allotropic form of oxygen;—he is justly regarded as good authority on such subjects.

It is seldom the case in science, that error is long accepted as truth; under the caustic tests of constant analysis and experiment, every fallacy becomes inevitably exposed. Thus has it been in regard to the long cherished and ingeniously defended position in regard to ozone—that it was nothing more than electrified oxygen. It is a doctrine that must certainly take its long rest, among the exploded fallacies of the past. Griffin, in his recent publications, states that the conversion of pure dry oxygen entirely into ozone was accomplished only once, by MM. Frémy and Becquerel; "that it is rash to come to the conclusion, that this object has been achieved from three experiments, of which two failed, and the best of which presents numerous reasons for doubt." The experiments of these gentlemen have always been cited as unanswerable proofs, in sustaining the position mentioned. Again, in opposition to the claim that pure dry oxygen can be electrified, we have the published statement that Baumert was totally unable to accomplish this, after the most patient and satisfactory trial. He found, "that when oxygen was electrified with an induction coil, at the rate of five hundred thousand sparks in an hour, the product of that enormous exertion of power, continued for an hour, was only as much ozone as separated one milligramme of iodine from the solution of the iodide of potassium." These are already strong and convincing proofs against the truth of the theory claimed, as regards the chemical composition of ozone. But to add the last and more recent testimony, we will quote a brief extract from a paper read by Dr. Andrews, F.R.S., and Mr. Tait, M.A., F.C.P.S., before the Royal Society of London:—"The commonly received statements that the whole of a given quantity of oxygen gas (dry), contained alone in a hermetically-sealed glass tube, can be converted into ozone by the passage of electrical sparks, is erroneous." These gentlemen found "that not more than 1-100th part of the oxygen could thus be changed into ozone." Dr. Griffin says of this last statement, "it confirms, with experimental evidence, my double pro-

position, that oxygen alone cannot be converted into ozone, and that oxygen, in the presence of the iodide of potassium in aqueous solution, can be converted into ozone." It will be remembered that Dr. Andrews was the authority on which Dr. Gregory (Prof. of Chemistry in the Edinburgh University) chiefly, if not solely relied. But the most complete and satisfactory proof of the falsity of the theory, that ozone is but electrified oxygen, will be found in the fact, that whilst it is almost impossible to convert pure dry oxygen into ozone by electricity, it is one of the easiest experiments in the laboratory to thus convert the oxygen (by electricity) into ozone, *if water moisture or hydrogen be present*. Thus, when oxygen, in tubes over an aqueous solution of the iodide of potassium, is submitted to the electric current, ozone is generated with rapidity. Dr. Griffin explains this very naturally by saying, "that the vapor of water rises into the oxygen gas and affords the hydrogen which is required for the formation of ozone." Again, it is now demonstrated, that when hydrogen is present, ozone can always be easily prepared, either by chemical or electrical means; but when hydrogen is absent, it becomes almost impossible to thus generate ozone, even in the most feeble quantity. As is appropriately asked by Dr. Griffin, "Why is this so? If ozone is only oxygen (even in *any* state), why is the presence of hydrogen so helpful, if not indispensable, to its formation?"

[To be continued.]

IMPROPER TREATMENT OF WOUNDS IN SOME OF THE UNITED STATES HOSPITALS.

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MUCH can be said on this subject to pain the intelligent surgeon, and overwhelm him with astonishment at the apparent ignorance in certain cases of some of the most common, as well as most important fundamental principles of advanced surgical science. Really, it would be worse than absurd to associate surgical principles with the dogmatic empiricism which has located itself in some of the Government hospitals to dictate terms of recovery; those terms are a formula of two words—viz., *R. Cold water*. This panacea seems, in these cases, to have supplanted every known remedy of whatever reputation, and is so terribly exacting and jealous, vindictive and despotic, that if, when on any of its "beats" through the wards, it should discover an unhappy poultice, or simple dressings, or tinct. opii, or tinct. myrrh., or adhesive straps, or stimulating unguent, God help the "contract" surgeon who has ordered them! If he has any friends, let them come close to him, and stand by him; he will need them every one to condole and advise with him over the note received from the medical director of that department, advising him his "contract" had been annulled for "inefficiency."

In taking up the subject matter of this essay, I would first state what I consider to be a true definition of a simple ulcer.

A wound healing by the "second intention," or by granulations, whether caused by a sharp or obtuse body, and a simple ulcer of whatever origin, present essentially the same physiological conditions, and require, the severity of the case considered, identically the same treatment. Both are healthy granulating surfaces, protected from the irritation of the air by a bland, creamy, non-irritating, *innocent* fluid; the whole being in the very best possible condition for a rapid recovery, and the vast majority of such cases would soon get well without any surgical assistance. It is not possible to *create* a better condition, and he who seeks to do so by much dressing and local applications, is a sad intermeddler. Farther than what can be done by constitutional support when necessary, there remain nothing but rest of the parts and proper cleanliness. By "proper" cleanliness is not to be understood that it should be sponged and drenched with any kind of application, three times, twice, or even once a day, with a fresh charge of lint every time; as if the more frequently the natural processes were interrupted by officious interference, the more rapid the recovery—the oftener nature were *outraged*, the *kinder* she would get. This is folly. If extremes are to be followed, if one prescription is to answer for innumerable cases, then far better were it to leave the unfortunate man to his own discretion and the "*vis medicatrix nature*." The wealthiest principle in all surgery, and the one to be ever present in the mind of the medical attendant, is "*to let well enough alone*." A healthy granulating surface should have the light dressing of lint removed, the surrounding *integument* gently cleaned with a moist linen rag which should not touch the tender granulations, and fresh lint kindly, tenderly replaced in the wound, only every morning; this is often enough for inspection, cleanliness and advantage of the patient. If you have to do with a general inflammatory condition, with its attendant local excitement, pain and swelling, an antimonial saline mixture—*R.* Potassæ bitart., ʒ i.; ant. et pot. tart., gr. iss.; morph. sulph., gr. i.; tinct. verat. viridis, gtt. xxx.; water, ʒ v. M. Sig. Tablespoonful every three or four hours, assisted with cold-water dressing—will soon allay all these symptoms, and cause the parts to return to a normal condition, which is a declaration that you have gone far enough with *this* treatment. If the ulcer feel better after the application of cold water, keep the lint saturated with it. When there is a vice, an impoverished constitution, or old age, be most careful how you withhold or withdraw tonics and alteratives; feed well. Of course, if the case become chronic, local stimulation will be necessary; for this purpose, I know of nothing which can excel the beneficial effects of wine of opium, wine of aloes or tincture of myrrh. Brandy and whiskey are in themselves excellent applications. In the morning, when you have replaced fresh lint in the wound, pour one of these articles gently

upon it till it becomes thoroughly wet. In this chronic condition never use or think of cold-water dressing. There is nothing to indicate it, and only harm will accrue from it.

But, when is an ulcer chronic? The prevailing idea is, when it has occupied an unusual time for recovery, has hard edges, has few or feeble granulations, or none at all. This is true, but certainly not all of the truth. A breach of surface, occasioned by constitutional vice, or mechanical injury, may present, at the very outset, all the essential characteristics of one of these ulcers, and require the same remedial measures before it will recover; but more of this anon.

What I consider to be a very good rule in this class of cases is, that the moment we notice the granulations losing their bright scarlet color and small size, becoming large, fleshy, bleeding, or very white and dropsical, as is sometimes the case in the wounds of drunkards, or in the drained and exhausted frame of the bed-ridden, begin stimulating dressings and general support; if, on the other hand, the granulations have partially disappeared, or are absent altogether, something like a mucous membrane taking their place, sometimes very sensitive and painful, discharging thin sanies, or serum, or a little lymph, and badly organized, offensive pus, sufficient only to keep the surface moist and the immediate dressing slippery, occasionally where the injury is deep and extensive, a prodigious amount, rapidly reducing the patient—be *prompt* with a generous support and alcoholic dressings. If dilute alcohol in the forms of brandy, whiskey, wines, pure or suspending opium, aloes, or myrrh, be not *strong enough*, then use it undiluted, saturated with one of these gums or aloes, keeping the lint constantly wet with it. The case will begin to improve immediately. Don't use cold water about these cases. Don't wash them, but wipe them clean; if a liquid is needed, make use of whiskey, or chlorinated soda.

I would touch upon a class of injuries over which the "cold-water cure" has held despotic sway, has had many devotees and a long list of victims. I allude to the indiscriminate, obstinate, persistent use of cold-water dressing in gun-shot injuries, ignoring as it does all pathological conditions, age, extent and character of the wound; everything must have a dose of it. I protest against it as empiricism subversive of most important surgical principles and established medicine, justly based, as they are, upon an intimate knowledge of the vital actions, properties, organization, functions and *habits* of a tissue or organ in health and disease. I object to it as a most sweeping prescription, doing vast harm in many United States hospitals. While douches of cold water generally act as a tonic when occasionally used, yet continued application of cold enfeebles, debilitates and prostrates the vital powers. When used locally, the capillaries contract, the surface bleaches from a paucity of blood, grows benumbed, shrivelled and cold, in degree proportionate to the inten-

sity of the cold and the patient's powers of resistance. Omitting those *penetrating* the skull, chest and abdomen, where there is an excess of vitality over the extremities and inflammation is most dangerous, gun-shot wounds *do not require this sedative treatment*; on the contrary, they are mostly feeble, and need stimulating applications to put them in a good condition by increasing the tonicity of the capillaries, elevating vital action, causing separation of the sloughs and the appearance of healthy granulations; else they will for days remain almost stationary, feebly reproductive, or *give up to a low degree* of inflammation and ulceration, becoming either a focus of pyæmia, secondary hæmorrhage, or phagedæna, *each and every one of which might have been avoided*. I cannot find terms sufficiently strong to express my indignation against the miserable habit of pouring cold water on these injuries, or allowing them to have their own way for days and weeks, till the patients finally become pyæmic, or have hæmorrhages or phagedæna.

There is not a doubt that nineteen twentieths of these deplorable results could have been avoided by the adoption of stimulating or alcoholic dressings at the outset. If the wound is seen several days or a week after its reception, and there be excessive inflammation, which is seldom the case, wait a day or so for it to subside, when, if healthy granulations and laudable pus do not appear, begin the treatment immediately. Don't be satisfied till these are obtained. If there is a bright areola surrounding the orifices, don't be apprehensive, this is asthenic inflammation:—keep the parts constantly moist with stimulating liquids, when the dry sloughs will soon be detached, the areola disappear, and beautiful granulations covered with laudable pus attest the wisdom of the treatment. In most cases the following will be found to answer admirably well:—*R.* Whiskey or brandy, Oiss.; tinct. opii, \mathfrak{z} v.; creasoti, \mathfrak{z} i. *M.* The Government quart bottles can be uncorked, a half pint poured out, and the other ingredients added.

The special treatment of sloughing phagedæna, I reserve for another article.

W. H. TRIPLETT.

Washington, D. C., August 24, 1864.

ON SYRUP OF CHLOROFORM.

By MR. T. B. GROVES, F.C.S.

I PRESUME, from the frequency of its use, that chlorodyne is at least a *convenient* preparation. Of its medicinal value I know nothing.

It was in attempting its preparation, with a view of satisfying myself as to its reported difficulty of accomplishment, that I met with the facts forming the purport of this communication.

It has been proved by experiment that chloroform is soluble in water to the extent of $2\frac{1}{2}$ minims only per ounce, and that if a spi-

rituous solution of chloroform containing a larger proportion than the above be added to water, the excess of chloroform soon finds its way to the bottom of the liquid, with which no amount of shaking will cause it to mingle sufficiently well to enable the dose to be accurately apportioned. This difficulty has been sought to be remedied in various ways. A Frenchman proposed a syrup of chloroform and glycerine, which he reported to have a marvellous aptitude to combine with water without decomposition. Mr. Squire, however, disposed of that fallacy as soon as it appeared.

Another form, also from a foreign source, consists of 1-100th of chloroform dissolved in oil and then emulsed with gum and syrups—probably a good form for sole administration, but ill adapted for combinations.

It occurred to me that if chloroform were reduced to exactly the same specific gravity as the syrup employed, by the addition of a liquid lighter than itself, mixture once effected would be permanent; there could apparently be no tendency to separation if the theory admitted of being practically carried out. It was also obviously a *sine qua non* that the lighter liquid should not be liable to be abstracted by the syrup, or the chloroform would inevitably be precipitated in the globular form, as in the case of chloric ether.

I have succeeded in making such a mixture by reducing the specific gravity of the chloroform by means of ether, and shaking them with a definite amount of syrup. The chloroform manifests no tendency to separation, even when present in the proportion of one-eighth, but a better form is that containing one-twelfth.

The *modus operandi* is as follows:—Put into a twelve ounce bottle one ounce of chloroform and about three drachms of ether; to the mixture add the same volume of the syrup to be employed; observe carefully the disposition of the fluids; the chloroform and ether will probably sink, then add *guttatim* more ether until the two liquids, on being shaken together, appear indifferent as to their position in the system; finally fill up the bottle with the syrup, and shake well for a minute or two.

The syrup should not be too dense, or it will be difficult to impart to it sufficient agitation to ensure the complete commixture of the fluids. The syrup should be composed of gum and sugar, of honey or treacle; syrup of sugar does not answer well, apparently on account of lacking viscosity.

The syrup thus formed has the same physical properties as chlorodyne, and, like it, is readily miscible with water in any reasonable proportion (one to seven), and soluble in the water where the proportion of chloroform is within the limits of its solubility.

The advantages attending its use are these:—1st. It does not need special precaution when being added to watery fluids, it being at once diffused completely, and in no case does it give rise to a deposition of large globules of chloroform. 2d. When added in ex-

cess of saturation, the undissolved chloroform is deposited in *very minute globules*, which, after lying together for days, show no disposition to combine, but may, by a few shakes, be dispersed evenly through the liquid, forming an emulsion sufficiently permanent to enable a dose to be measured without difficulty.

I will conclude by proposing the following form for an anodyne containing chloroform (founded on one published by Dr. Ogden), which will be found to remain combined and to mix readily with either spirit or water:—Take of chloroform, 3 iv.; ether, 3 iss.; oil of peppermint, gtt. viij.; resin of cannabis, gr. xvj.; capsicum, gr. ij. Macerate for two or three days and filter. (No. 1.) Then take of muriate of morphia, gr. xvj.; hydrocyanic acid Sch., ℥ xcvj.; perchloric acid, water, aa 3 ss.; syrup of treacle (or honey), to make in all 4 ounces. Dissolve the muriate of morphia in about an ounce of syrup, to which has been added the perchloric acid and water, assisting solution by a water-bath, and when cold add the prussic acid.

Here, as it is absolutely necessary to preserve the relative proportions of these potent medicines, and also to include them in a given bulk, the manipulation is not so easy. It is only to be done, so it appears to me, by balancing separately the chloroformic tincture with the morphia syrup, and then again with a plain syrup to be used in making up the exact measure of the completed article. The balancing must be effected by adding water *guttatim* to a syrup denser than necessary. Then having ascertained by the balance the proportions required, quantities of the *same* materials, no matter how great, can at once be adapted for use without further trouble.

My chief object in giving the details of this process is to enable prescribers to devise for themselves, if they think fit, a form of the *exact* composition of which they are aware—an all-important requirement, one would imagine, where remedies of great potency are to be administered.—*Amer. Journal of Pharmacy*, from *Lond. Phar. Journal*.

Reports of Medical Societies.

EXTRACTS FROM THE RECORDS OF THE BOSTON SOCIETY FOR MEDICAL IMPROVEMENT. BY FRANCIS MINOT, M.D., SECRETARY.

AUG. 8th.—*Tuphlo-enteritis*; *Peritonitis without Tenderness of the Abdomen*.—Dr. J. HOMANS, Jr. (who was present by invitation) reported the following case, which occurred under the care of Dr. T. E. Francis, of Brookline, whom Dr. H. assisted in making the autopsy. The patient was a young woman, a sempstress by trade. Dr. Francis was called to her at 3 o'clock on the morning of Monday, August 1st. She had been suffering severe pain in the bowels for five hours, had vomited once, and had three or four loose discharges from the bowels.

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He ordered tincture of opium every half hour till relief, and at 8 o'clock he found her free from pain. She had a coated tongue, and he prescribed a drachm of fluid extract of senna every three hours till it operated. On Wednesday the patient was easy, asking for food. She had no tenderness of the bowels, but complained of an uneasy feeling in the left side, and of general soreness. On Thursday the patient had a return of the diarrhoea, which was ascribed to her taking beef-tea. On Friday the patient was better, the tongue cleaning. On Saturday she was sitting up, said she felt much better, and was hungry. She went to bed comfortable, and slept soundly till 3 o'clock on Sunday morning, when she awoke in sudden pain, and faint. Some gin was given her, and when Dr. Francis arrived she was relieved, having eructated much wind. She had, however, a strange, anxious expression, and a bad, quick, small pulse. She fell asleep, but awoke in an hour, faint, and died in a few minutes. The patient referred all her pain to the left side of the abdomen, in the region of the descending colon. There was no tenderness over the cœcum, or in any part of the bowels; but the countenance wore an anxious expression. On Wednesday, in the midst of her sickness, her menstruation came on, naturally, and at the right time, and a nervous agitation was attributed to its accession.

At the *post-mortem* examination the peritoneum was found of a pinkish hue, and covered with recent, soft adhesions. Near the ileo-cœcal valve was a collection of pus and lymph. The appendix contained a foreign body, which resembled a pill, or perhaps some seed. It was firmly impacted, half an inch from the intestine. The mucous membrane of the appendix around and beyond it was sloughy, but there was no perforation.

AUG. 8th.—*Spina Bifida over the Sacrum; Operation; fatal on the third day.*—The patient, a little girl 7 years of age, entered the Massachusetts General Hospital, under the care of Dr. CLARK, on the 9th of June, and the following report was made of her case:—

She was born with a small tumor over the sacrum, which has grown steadily ever since. She has never had any pain in it, except on pressure. On examination, it was found to be an ovoid, tense, though fluctuating tumor, $16\frac{1}{2}$ inches in circumference at its base, and projecting five inches from the body, and at right angles with it; situated over the sacrum and coccyx; it cannot be reduced in size by pressure. Otherwise the child is in perfect health, has a good appetite, and seems as well as other children of her age. The tumor was covered by integument, but the parietes in some parts seemed almost thin enough to burst.

June 11th.—A trocar was thrust into the apex of the tumor, and about a pint of perfectly clear, colorless fluid evacuated. Needles, armed with strong ligatures, were then passed through the base and at various other points of the tumor, and tied and wound firmly around it. There was no appearance of spasm, and the pulse did not falter at any part of the operation.

Examination of fluid by Dr. White.—Colorless, odorless, clear, neutral. Specific gravity, 1006. It contained a small quantity of albumen, and resembled the fluid generally drawn from hydrocephalus. Microscopically—a small flaky deposit of granular matter and cells of epithelium.

12th.—The patient had severe pain after recovering from the ether yesterday, and an opiate was given in the afternoon. Much pain this A.M. Repeat opiate. Tongue white. Pulse 120, sharp and small. Pale, restless and irritated. The parts included in the ligature are contracted, shining, purple, cold, but the base is more tense, as if it contained fluid in increased quantity.

13th.—Tumor red and inflamed to-day, and somewhat hardened. Patient lies on the left side, with the head strongly flexed backward, and objects to change of position. Makes no complaint, though she has intense pain and headache. Pulse 140. No appetite. Tongue coated. Milk punch was ordered.

P.M.—Pulse 152. Skin hot and dry. Tumor very red and tense.

14th.—Still lies on the left side, with the head still more strongly flexed backward, and says she cannot move it. Cries out and complains but very seldom, although she says the pain and headache are intense. Tumor has leaked a good deal the past thirty-six hours; the strangulated portion is quite black and cold; the base not quite so tense, but inflamed. Opiates.

P.M.—Continues in same position, with thighs flexed to about a right angle on abdomen. Pulse 164, and can only be counted by placing the ear over the heart; sounds very indistinct and fluttering. Respiration, which since the operation has been very quiet, is becoming a little harder and hesitating. About 8, P.M., she became quite restless, and turned over in bed, lying on the right side, and respiration was quite labored. Tumor continued to leak all the time. About 9½, P.M., she straightened her legs for a few minutes, not stiff, but as if for a change, though she kept her head flexed strongly back all the time; and in a few minutes died quietly, without having had any symptom of spasm.

The parts were removed after death, and handed to Dr. Jackson for dissection, who exhibited them to the Society, and read the history of the case, at the request of Dr. Clark, who was unable to be present. The nerves having been cut upon each side within the spinal canal, the spinal marrow was withdrawn with the tumor, which last was dissected off from the sacrum. The cavity that contained the fluid was formed by a dilatation of the spinal membranes—a probe being passed directly upwards from it. The spinal marrow came down of full size, and was gradually lost upon the inside of the sac, nearly or quite two inches from its orifice; two or three slender but quite firm cords went off from it, to be inserted into the inner surface of the sac, at some distance from their origin, and which it was thought might be nerves; one or more of these seemed to be implicated in the ligature. The quantity of fat in some parts, between the cyst and the skin, was considerable. From the fact that it had been included in the ligature, the cuticle had separated to some extent, but there was no appearance of sphacelus, and neither was there any appearance of inflammation upon the inner surface of the cyst, though there was some lymph on the spinal membranes. The sacrum, which had been prepared, showed a deficiency posteriorly, but otherwise it was well formed.

Dr. J. alluded to a large collection of cases of this form of spina bifida which he had published some years ago, and showed specimens

from the Society's Cabinet. (See Boston Med. and Surg. Journal, Vol. LIX., page 355.)

Aug. 22d.—*Gangrene in Patients not resident in Hospitals.*—Dr. W. E. TownsEND reported the following case:—

D. S., private in Co. "I," 1st Mass. H. A., was wounded, June 18th, 1864, in the battle near Petersburg, Va., the ball taking effect near the middle third of left fore-arm. After he was wounded he walked to the Corps Hospital, a distance of nearly six miles. Here his wound was dressed. The next morning he walked to City Point wharf—a distance of six miles. On the same day he went on board the transport and was carried to Washington. Arriving there, he was sent to Harewood Hospital. His wound at this time was doing well—clean and healthy. July 4th, he received a furlough to go home. Did not know whether there was gangrene in the wound or not when he left the Hospital, but it had increased in extent. He left Washington July 4th, and arrived in Salem, Mass., July 6th. Walked the same night from there to Danvers, a distance of five miles, at which place he arrived at 9 30 P.M. Three days afterwards the wound had grown worse, and pained him a great deal, so that he was confined to the house. He grew worse until July 21st, when he entered the U. S. Army Mason General Hospital, in Boston.

At this date the wound was gangrenous. After his admittance into this Hospital, it gradually began to clean and heal. Aug. 10th, it was perfectly clean and healthy. On this day, which was very hot, he walked out. The day following he again had a pass, and walked with his wife around the streets, and on the Common—in fact, he says, he "walked a good deal, and it was terribly hot," and he was very much heated. Two or three days after this, the wound assumed a new character, and rapidly grew worse; gangrene supervening, during the course of which some hæmorrhage occurred, which was fortunately checked by compression. With rest and appropriate treatment, he became again better, and is now doing well, though the wound is not yet healed.

This case was thus fully reported, to show that other causes, besides impure air or hospital contagion, cause wounds to assume the gangrenous aspect, and that over-exertion, fatigue or excitement are productive of this danger to wounded men. All the cases that have yet occurred in this hospital have been in patients who entered with the disease. Great care has been taken of the ventilation and drainage of the house, and of the proper distribution of the patients. Strict attention has been given to the care of the sponges, never allowing the same one to be used for two different persons. They are thoroughly washed with hot water and chloride of soda every time they are used, and then exposed on racks to the air.

Since June 1st, besides the patients in the house, about one hundred and seventy-five officers and men have had their wounds dressed at this hospital, some for weeks at a time, and no case of gangrene has occurred that can be attributed to hospital contagion, although the disease has been constantly present. No patient has yet died from this cause. The treatment has been the free use of stimulants and nutriment, the chlorate of potash and muriatic acid wash, and frequent dressings.

THE BOSTON, MEDICAL AND SURGICAL JOURNAL.

BOSTON: THURSDAY, SEPTEMBER 15, 1864.

THE SANITARY COMMISSION; ITS CONTRIBUTIONS TO MEDICAL LITERATURE.—When this struggle for right is ended and peace and victory are fully ours, when the fresh grief for those slain by battle and disease shall have given place to resignation and pride, and when our Walhalla shall be filled with the memories of departed heroes, and the worship of the living warrior shall have somewhat faded, then we shall come to recognize many a deed of patriotism, suffering and philanthropy now almost unnoticed. There have been from the first Christian influences at work which have made this war unparalleled in history, and which will be remembered when individual glory shall have been forgotten. There is even now but one heroic and glorious name which survives the momentous events which held the attention of the world so long upon Sebastopol, although the existence of empires was at stake and Europe's greatest chieftains were in the field. Thousands of strong men were perishing by disease when Florence Nightingale raised her white hand to save them, and departed on her noble mission of mercy. The same spirit which sent her forth almost alone, has raised up in our day a host of like spirits to prevent the errors and misery it was her late task to reform, and the labors of the United States Sanitary Commission will never cease to be regarded as one of the grandest triumphs of Christianity. What these labors have been we all know, for they have been the labor of love of a whole nation, and there is hardly a man or woman, or child even, who has not contributed in some way to its interests.

Among the doings of this noble Commission, none are more praiseworthy than the efforts it early made to thoroughly instruct its agents in their respective duties, and the publications it has issued from time to time for this purpose have been productive of great good. The beginning of the rebellion found us as unprepared in the department of military surgery as in the other requirements for the conduct of a great war, and the Commission accordingly invited medical gentlemen to prepare practical memoirs upon special subjects with which they were particularly acquainted, which were published as monographs, and distributed among the medical officers of the army. These essays were received with great favor by the profession here and in other countries, and the demand for them has been so great that they have been re-printed several times. This success has induced the late Surgeon-General to issue them in a more permanent form, and he has accordingly republished them in one volume.* In arranging these, he has divided them according to the subjects of which they treat:—1st, those relating to the prevention of disease; 2d, those on medical subjects; 3d, those relating to surgical matters. He has added a few short notes in connection with several of the subjects; but we would

* Military, Medical and Surgical Essays prepared for the U. S. Sanitary Commission Edited by WILLIAM A. HAMMOND, Surgeon-General U.S.A., &c. Philadelphia: J. B. Lipincott & Co. 1864.

like to have seen this portion of the work extended, for his opportunities of verifying many of the points discussed have of course been immense. The table of contents, which we give, will be enough, we believe, to stimulate the desire of our readers to possess this valuable volume. Where so much is excellent, it would be invidious to call particular attention to any of these memoirs, but some of them are models in point of research, brevity and simplicity. Together, they form an octavo volume of 552 pages, which in splendor of paper, print and binding is unsurpassed by any medical work with which we are acquainted.

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THE CASE OF SURGEON-GENERAL HAMMOND.—(*Concluded.*)—In reporting upon this case, the second charge—conduct unbecoming an officer and a gentleman—will be first considered.

Under this charge it was alleged that accused made a false declaration, in writing, that Dr. Cooper had been relieved from his position as medical purveyor at Philadelphia, because, among other reasons, General Halleck had requested, as a particular favor, that Dr. Murray might be appointed to duty in that city.

It appears from the evidence that, on the 8th of October, accused requested of the Adjutant-General that Dr. Cooper might be relieved from duty as medical purveyor, at Philadelphia, by Dr. Smith. On the 13th, he wrote a letter to Dr. Cooper, as follows:—

"MY DEAR DOCTOR,—I have just received your note. The detail for your relief from duty went to the Adjutant-General a few days since. I told Smith to tell you of it. It was with great reluctance, even with pain, that I made the detail. I am entirely satisfied with your energy, faithfulness, and acquaintance with your duty; but I found great complaints in regard to your manners, which were constantly reiterated from medical officers and citizens of standing. I believe

the change would have been made over my head had I not made it myself. I was forced to come to the conclusion that it was necessary to be done. Once before the detail was made, but I would not sign it, and this time it lay on my table several days. This is one reason. The second is even more imperative. Halleck requested, as a particular favor, that Murray might be ordered to Philadelphia. There was nothing for Murray to do there but to take your place, King's, or Smith's. The latter have both been in active service, and I thought it best to relieve you on that account.

"As A. K. Smith is, in my opinion, better suited to perform the duties of purveyor than Murray, I decided to make him purveyor, and Murray medical director of transportation.

"I assure you that, so far as your official action is concerned, I have not the least fault to find.

Yours sincerely,

W. A. HAMMOND."

General Halleck testified, substantially, that "to the best of his recollection," he never made any request of the accused to order Dr. Murray to Philadelphia; the only communication he ever made to him on the subject being a letter on the 1st of October, stating that Dr. Murray had served long and faithfully in the field, with the army in the West, and would like to be transferred to Eastern hospital duty, and asking the consideration of his case.

On the part of the defence, a letter from Dr. Murray to General Halleck, dated Louisville, Sept. 27th, was submitted, in which Dr. Murray stated to General Halleck, that if he would request the Surgeon-General to order him to Philadelphia, it would "be done at once." And it was claimed by the accused—but not shown—that General Halleck, besides writing the letter of October 1st, in which he asked that Dr. Murray's desire to be ordered East on "hospital duty" might be considered, also, in some personal interview, made a verbal request that he be assigned to that duty in Philadelphia.

The findings upon the first and third charges involve questions of law as well as of fact.

It was contended by the accused that the Surgeon-General had the power to control all purchases of stores for his department; to order purveyors when, at what places, of whom, and at what prices they should procure them; and further, that he might purchase them himself.

It was submitted by the Judge Advocate that the acts of Congress of April 16, and July 17, 1862, limited the authority of the Surgeon-General to the direction when to purchase, and the kind and quantity to be procured; that, having given this direction, his lawful authority was determined, leaving to medical purveyors, under bonds for the proper discharge of their responsibilities, the whole duty of selecting in such markets, and of buying from such persons, and upon such terms as their judgment dictated.

The former of these enactments provides "that medical purveyors shall be charged, under the direction of the Surgeon-General, with the selection and purchase of all medical supplies, including hospital stores," &c. &c.

The latter makes provision that medical purveyors shall give bond, with approved security, in such sums as the Secretary of War shall require, for the faithful performance of their duties.

That the natural and necessary result of the acts of the accused, as established by the record, involved a criminal spoliation of the Government treasury, which would alone have called for his dismissal from the service, cannot be denied; but when it is remembered, as shown by the proof, that this spoliation was in part accomplished by the purchase of inferior medical supplies and stores—thus compromising the health and comfort, and jeopardizing the lives of the sick and wounded soldiers suffering in the hospitals and upon the battle-fields of the country—soldiers solemnly committed to the shelter and sympathies of the office held by the accused, by the very law and purpose of its creation—it must be admitted that this fearfully augments the measure of his criminality.

The trial, which lasted nearly four months, was one of the most patient and thorough that has ever occurred in our military history; and the accused had throughout the assistance of eminent and able counsel in conducting his defence. The court, which was composed of nine general officers, at the close of this pro-

longed investigation, declared him guilty of the charges preferred, and awarded the punishment, which, in their judgment, was in accordance with the nature and degree of the offences committed; and a careful examination of the record leaves no room for doubt as to the validity of the proceedings, or the justness of the findings and sentence.

J. HOLT, Judge Advocate General.

Since the promulgation of his sentence, the following card has been issued by Dr. Hammond:—

A CARD.—The undersigned has read in the *Sunday Morning Chronicle* of this city, the remarks of Judge Advocate General HOLT on the proceedings of the Court-martial in his case.

He learns from this review and from the order of the President appended, that he has been dismissed the army and prohibited from ever holding office under the United States.

The undersigned has no idea that he will lose one friend by this action of the Administration, but his good name is valuable to him, not only as regards those who know him but those who do not.

So soon, therefore, as he is furnished with a copy of the findings and sentence of the Court, he will present to the public a brief history of the facts leading to his arrest and trial, a review of the record in his case, and some commentaries on the report of the Judge Advocate General.

With these he will be content to submit to the judgment of the world as to how far he has been guilty of the offences charged, and how far he has been the victim of conspiracy, false swearing, and a malignant abuse of official power.

Washington, Aug. 22, 1864.

WILLIAM A. HAMMOND.

Dr. JOS. K. BARNES, who for many months past has been Acting Surgeon-Gen., has been appointed Surgeon-General of the United States Armies, *McC* Dr. Wm. A. Hammond, dismissed the service.

Surg. RICHARD S. SATTERLEE, Medical Purveyor U. S. A., who has been stationed at New York since the war, has been promoted to the rank of brigadier-general. This honor has been bestowed, as is officially stated, "for diligent care and attention in procuring proper army supplies, as Medical Purveyor, and for economy and fidelity in the disbursement of large sums of money."

Dr. James King has resigned his post as Surgeon-General of the State of Pennsylvania, and Dr. Joseph A. Phillips, formerly Assistant Surgeon-General, has been appointed to the place.

VITAL STATISTICS OF BOSTON.

FOR THE WEEK ENDING SATURDAY, SEPTEMBER 10th, 1864.

DEATHS.

	Males.	Females.	Total.
Deaths during the week	75	55	130
Ave. mortality of corresponding weeks for ten years, 1853—1863,	51.2	49.1	100.3
Average corrected to increased population	00	00	110.38
Death of persons above 90	0	0	0

DIED.—In Philadelphia, Pa., Dr. R. M. Huston, 70. Dr. H. was formerly Professor of Obstetrics and the Diseases of Women and Children in the Jefferson Medical College, and for some time Editor of the Medical Examiner.

DEATHS IN BOSTON for the week ending Saturday noon, Sept. 10th, 130. Males, 75—Females, 55.—Accident, 1—disease of the bladder, 2—inflammation of the bowels, 3—congestion of the brain, 3—disease of the brain, 2—cholera infantum, 16—cholera morbus, 2—consumption, 18—convulsions, 3—croup, 2—debility, 2—diarrhoea, 8—diphtheria, 4—dropsy, 5—dropsy of the brain, 3—drowned, 2—dysentery, 8—dyspepsia, 1—scarlet fever, 3—typhoid fever, 3—gangrene, 1—disease of the heart, 1—infantile disease, 1—intemperance, 3—disease of the kidneys, 2—disease of the liver, 1—congestion of the lungs, 1—inflammation of the lungs, 2—marasmus, 3—old age, 2—paralysis, 2—premature birth, 2—puerperal disease, 1—purpura, 1—sciatika, 1—disease of the skin, 2—disease of the spine, 1—disease of the stomach, 1—teething, 1—unknown, 6—whooping cough, 3—gun-shot wound, 1.

Under 5 years of age, 66—between 5 and 20 years, 9—between 20 and 40 years, 21—between 40 and 60 years, 20—above 60 years, 14. Born in the United States, 89—Ireland, 28—other places, 13.